THE RELATIONSHIP BETWEEN CONSTRUCTION OUTPUTS AND GDP: LONG-RUN TRENDS FROM PORTUGAL

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How do students learn to detail from first principles? An innovative Level 3 undergraduate module was designed with the aim of encouraging students to approach architectural detailing from first principles within an environmentally responsible framework. The philosophy behind the module was to incorporate lecturers' research into the module, both to enhance the student experience and to narrow the gap between research and teaching. A brief overview of the development of the module and the teaching and learning strategy is provided before looking at delivery and evolution of the module over a two-year period. The students' evaluation of the module, via a questionnaire survey, is then reviewed and issues for further consideration highlighted. A number of observations are made relating to the integration of knowledge, which have implications for all contributors to construction.

Keywords: Construction outputs, economic development, GDP, Portugal.

INTRODUCTION

The study of the construction industry and its role in national economy has been extensively addressed. At the macro level, existing assumptions persist that structural changes will emerge in the construction industry of a particular country as the national economy develops over time. Turin (1973) analysing the role of the construction sector in economic development presented a development pattern of the construction industry based on stages in development. The main aspects of the development pattern were that in the early stages of development, the share of construction in national output first grows at an increasing rate and then at a decreasing rate with the level of national income. This 'S' shape pattern contrasts with Bon's (1992) inverse 'U ' shape pattern in which the share of construction in national output increases in the early stages of development but ultimately will decrease in absolute and relative terms in more advanced industrial countries. Another important aspect of the development pattern derived from the latter work is that while the share allotted to improvement and maintenance in total construction increases, the proportion for new construction decreases in the latest stages of development. Ruddock (1999) using more recent data collected from a large sample of countries representing all stages of economic development corroborated this proposition.

The role of the construction industry in national economy has also been explored by several writers through the use of input-output tools. Because of its double accounting framework, input –output tables are well suited for the analysis of the interdependence

between the construction industry and other industries forming the national economy. Some of these works (Bon, 1991; Bon and Pietroforte, 1993; Pietroforte and Gregory, 2002, among other references) have focused on the change in sectoral shares, and also in the study of the direct and indirect resource utilisation by the construction sector, both at country level and in comparative historical analysis across advanced industrial countries. The output multiplier of the construction industry tends to be the largest among the industries in a national economy, thus indicating the great demand for construction's intermediate inputs provided by other sectors, particularly inputs from the building materials industry. However, in advanced industrial countries, there is a gradual shift of construction purchases from manufacturing to services- the old and new engines of economic growth and development (Bon, 1991). The major snag in these studies is that input-output data are relatively outdated compared to national accounts data, even in highly developed countries, and inconsistency in the compilation of the tables across countries.

Differing views on the role of the construction industry in national economy have been put forward. De Long and Summers (1991), using data drawn from more than 60 countries of all continents, and for the period 1960-1985, found no significant association between construction investment and economic growth. Lopes (1998), in his study of the construction sector of developing countries in Africa, posited that the growth in the construction should follow that of the general economy. These somewhat contrasting views on the role the construction sector plays in the national economy are perhaps associated with the issues derived from data definitions and measurement problems pertaining to the construction industry, both at country and international levels. The development of a single–agency responsibility for data collection and the setting up of regional construction databases are pertinent in this context (Ruddock, 2000). Added to this, more and better country studies are also needed in order to have a fuller comprehension of the specificities of the construction industry and its role in economic development.

In the remaining of this paper, the statistical sources used in the study are stated. Next, data on different indicators of construction industry activity and of GDP in Portugal for the period 1986- 2002 are presented and analysed. Then, a comparison is made between the development pattern of the Portuguese construction industry throughout the 1990s and those from specific OECD countries and Lithuania. Finally a concluding comment summarises the paper.

STATISTICAL SOURCES

The intention of this section is to provide a brief explanation of the accounting procedures of the main bodies concerned with the provision of data and other statistical information pertaining to the construction industry and related sectors in Portugal. The main statistical sources used stem from the various publications of the National Institute of Statistics (INE). The INE *Quarterly National Accounts* is the official publication that provides the most important statistical data concerning the nation. However, data before 1995 are provided by *National Accounts* also published by INE. As data for the period 1985-1990 have not been revised, data on GDP and CVA for this period are drawn from the *Annual Report* published by the Bank of Portugal. Thus data for this period are not strictly comparable with those from 1990-2002. As with other Western European nations, the *Quarterly National Accounts* is fully consistent with the European System of National and Regional Accounts (ESA95). It provides data on Construction Value Added (CVA) and Gross Fixed
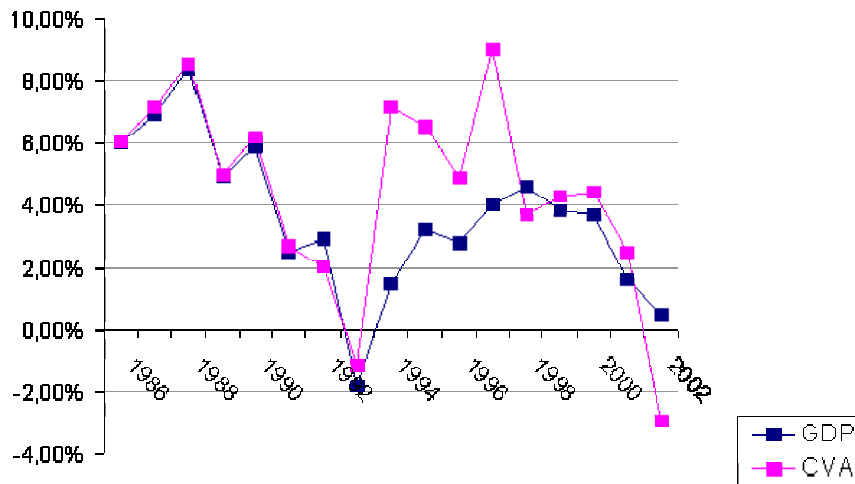
Source: INE-a (various issues); Bank of Portugal (various years)

Capital Formation in Construction (GFCFC), both in current and constant prices.
However, since 1995, GFCFC data have not been presented in a disaggregated form.
Data on construction employment stems from the *Employment Statistics* published by
the INE. The *Construction Annual Report* published by AECOPS (Association of
Construction and Public Works Contractors) provides data on Gross Production Value
(GPV), disaggregated into its different market sub-segments, and the data are based on
regular surveys on construction companies. As there is no official data pertaining to
the repair and maintenance (R & M) sub-segment, the figures presented in this study
should be taken with a great degree of caution. However, it is generally recognised
that R & M data are under-estimated.

DATA AND ANALYSIS OF THE PORTUGUESE CONSTRUCTION INDUSTRY

Since the entrance of the country in the European Economic Community in 1986, the
Portuguese economy has entered an era of sustained economic growth. The run-up in
the economic process and monetary integration started in the early 1990s, coupled
with the transfer of European Union (EU) structural funds, has impacted heavily on
the construction industry activity and economically related sectors. New residential
building and civil engineering works have been the driving forces bolstering this
remarkable growth throughout the last sixteen years.

EVOLUTION OF CONSTRUCTION INDUSTRY INDICATORS AND GDP

Figure 1 shows the evolution of the growth rate of the construction value added
(CVA) and that of the GDP for the period 1986-2002. It is easy to see that the CVA
experienced a sustained growth in the period despite a drop-off in CVA in 1992/1993,
which was accompanied by a plunge in national output after the world-wide economic
recession in 1991/1992, and in 2001/2002. Two development patterns can be clearly
observed in this period. In the period 1986-1993, the growth of the CVA accompanied
that of the national output while in 1993-2002 the growth rate of the former indicator
was higher than that of the latter. As shown in Table 1, both CVA and gross fixed
capital formation in construction (GFCFC) experienced a remarkable increasing
growth in the period 1991-2002 , peaking in 1997, which coincided with the

Table 1: Construction Value Added (CVA), Gross Fixed Capital Formation in Construction (GFCFC) and the Share of CVA in GDP (1990-2002)

Year	CVA (constant 1995 million EUR)	GFCFC (constant 1995 million EUR)	Share of CVA in GDP (%)
1990	4045.6	8348.5	5.5
1991	4181.3	8814.3	5.6
1992	4341.9	9152.9	5.7
1993	4311.2	9088.1	5.5
1994	4385.7	9245.2	5.6
1995	4853.3	9824.8	6.0
1996	5090.2	10361.0	6.2
1997	5432.6	11784.4	6.7
1998	5727.4	12592.0	6.6
1999	5893.7	13053.6	6.6
2000	6155.0	13645.3	6.6
2001	6308.3	14017.8	6.5
2002	6060.2	13547.6	6.4

Source: INE-a (various issues)

completion of most of the major infrastructures and developments of the World EXPO' 98 hosted in Lisbon. The share of CVA in GDP increased from 5.5% in 1990 to 6.7 in 1997 and fell to 6.4% in 2002. Thus, a trend of decline is clearly apparent in the last four years.

The growth in construction activity is also visible in employment. Table 2 shows data on construction employment, total employment and the contribution of construction to total employment for the period 1990-2002. Although the data for the whole period are not strictly comparable due to changes in statistical procedures and coverage (until

Table 2: Employment by Construction Industry and Total National Employment and Share of Construction Employment in National Employment: 1990-2002

Year	National Employment (000')	Construction Employment (000')	Share of Construction in National Employment (%)
1990	4466.3	352.6	7.9
1991	4631.0	362.8	7.8
1992 *	4340.7	346.2	7.9
1993	4255.2	340.2	8.0
1994	4251.1	330.8	7.8
1995	4225.1	340.3	8.1
1996	4250.5	343.1	8.1
1997	4331.8	388.4	9.0
1998 *	4863.3	518.8	10.9
1999	4928.7	538.7	11.2
2000	5028.9	596.4	12.1
2001	5098.4	586.1	11.5
2002	5106.5	622.3	12.2

Source: INE-b (Employment Statistics)   *Note: * - New series*

Table 3: New Construction and R & M in Portugal and in Euroconstruct Countries (%): 1998-2002

	Residential Building	Non Residential Building	Civil Engineering	Repair & Maintenance	Total
Portugal	48.8	17.2	26.4	7.6	100
Euroconstruct (average for 15 countries)	24.0	19.5	20.5	36.0	100

Source: AEC0PS (various years)

1998, data referred only to the Portugal mainland and after 1998 to all of Portugal), an absolute and relative growth was generally observed, particularly from 1995 and subsequently. The share of construction employment in total employment reached 12.2% in 2002, one of the highest levels in the European Economic Area.

COMPOSITION OF THE CONSTRUCTION OUTPUT IN PORTUGAL

As stated before there is no official data on R& M construction works in Portugal. The National Institute of Statistics only published disaggregated data on GFCGC for the period 1990-1995. GFCFC comprises residential buildings, non- residential buildings, civil engineering and other construction works, but does not include R&M works. According to AECOPS (2003), which used data from the *Euroconstruct Report*, the share of the R & M sub-segment averaged 7,6% of the total market output for the period 1998-2002, the lowest value among the Euroconstruct countries (Table 3). Although the figures from Portugal, as noted earlier, might be under-reported, they do reflect somewhat the structural imbalance of the construction market, let alone issues concerning data availability and reliability. However, data on awarded public work tenders (AECOPS, various years) suggest that there has been a marked increase in R & M construction work. The share of R & M public works in total public works increased from 13% in 1993 to 26.4% in 2000. The repair and maintenance of the road network accounted for most of this increase.

The recent legislative measures targeted at stimulating initiatives for the rehabilitation and modernisation of specific aging residential parks, particularly in the metropolitan areas, added to the EU directives to lower the VAT in labour-intensive industries, will undoubtedly contribute to the development of this sub-segment of the construction market.

COMPARISON BETWEEN PORTUGUESE CONSTRUCTION SECTOR WITH THOSE FROM SPECIFIC COUNTRIES

This section compares the development pattern of the construction industry in Portugal with those from specific Organisation for Economic Cooperation and Development (OECD) countries and Lithuania. Data presented here is taken from Carassus *et al* (forthcoming). This work is a result of a CIB W55-W65 *Project Group Comparative Analysis* which aims at comparing the 'construction sector system' of nine countries (see Fig 2) using a common method of analysis. Portugal is among the OECD countries studied here the sole which is considered a high- middle-income economy (Word Bank, 1992). The other middle-income economy analysed in the study is Lithuania which is not a member of the OECD countries, let alone being in a

transition process from a central planning economy to a marked-based economy. The remaining countries are considered high-income economies.

The Weight of the Construction Sector in the Economy
As shown in Fig.2, the share of CVA in GDP decreased relatively in all countries in the period 1990-2000 except in Portugal and Lithuania. Whereas in Portugal, a marked increasing growth, both in absolute and relative terms, was observed (see also Table 1), Lithuania experienced an irregular pattern of growth with a slight trend of decline in the late years of the period. In the beginning of the XXIst century, construction value added (CVA) represented 4-5 % of the national economy in the highly developed countries and about 6% in Lithuania. In Portugal, this value was about 7%. These results seem to corroborate Bon's (1992) assumptions about the declining share of construction in the advanced industrialised countries. However, this pattern does not hold for the construction volume according to data provided by Carassus *et al* (forthcoming) and also suggested in the diagrams depicted in Fig.2.
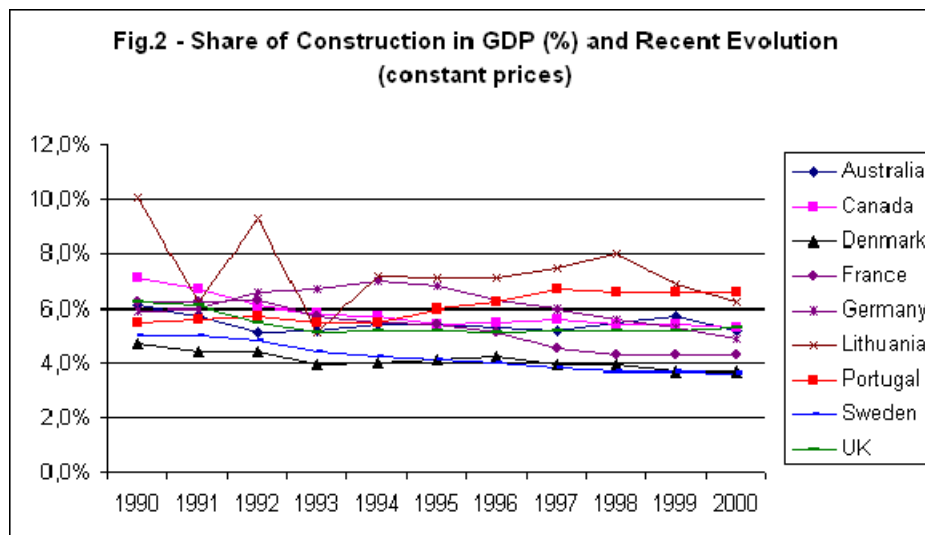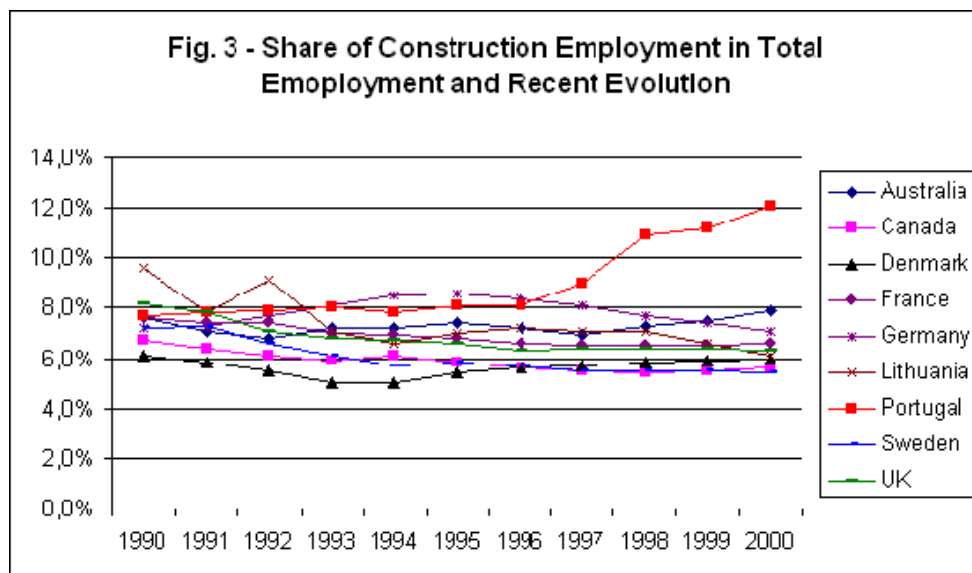

Source: Carassus el al (forthcoming); Table 1

The evolution of construction employment followed a pattern similar to that of the CVA. Fig 2 indicates that construction employment decreased relatively in the period 19990-2000 except in Portugal and Australia. In 2000, construction employment contributed to 12.1 % to national employment in Portugal and about 6% in the remaining countries (a little higher in Australia). Comparing Figs. 1 and 2, it is observed that the weight of construction in national employment is higher than in national output. In Portugal this pattern is far more pronounced, which is a reflection of a less industrialised construction industry activity. he evolution of construction employment followed a pattern similar to that of the CVA. Fig 2 indicates that construction employment decreased relatively in the period 19990-2000 except in Portugal and Australia. In 2000, construction employment contributed to 12.1 % to national employment in Portugal and about 6% in the remaining countries (a little higher in Australia). Comparing Figs. 1 and 2, it is observed that the weight of construction in national employment is higher than in national output. In Portugal this pattern is far more pronounced, which is a reflection of a less industrialised construction industry activity.

Table 4: New construction and Repair & Maintenance (percentages of the value of the total construction production)

%	Australia	Canada(1997)	Den-mark(2000)	France(2000)	Germany(1999)	Lithuania	Portugal(2000)	Sweden(2000)	UK (2000)
New construction buildings	36	41	33	40	51	20	68	25	48
R & M buildings	38	21	38	37	34	27	6	53	25 *
New construction Civil Eng.	20	36	17	15	11	17	24	17	8
R & M Civil Eng.	6	2	12	8	4	36	2	5	19 *

Source: Carassus el al (forthcoming)

*Note * Figure for building includes only residential R&M, and the figure for civil engineering includes all non-residential R&M (including commercial etc).*

Source: Carassus el al (forthcoming); Table 2

Composition of the Construction Output

Repair and maintenance represent more than 45 % of construction work in most of the countries studied (see Table 4). This percentage is lower in Germany and Canada, but is not less than 25%. However, in Portugal this percentage is almost insignificant - 7.6%. Repair and maintenance activity is not as well represented in the official statistics as new construction due to DYT activities and informal economy. In terms of the composition of the construction output, new buildings represented 68% of total construction works in Portugal in 2000, being the share of residential buildings about 50%. The weight of the civil engineering segment is very high in Australia, Canada, Lithuania and Portugal. This high percentage of civil engineering works in Canada may be explained by the economic and industrial structures of the country. A great part of its industrial activities are based on exploitation of natural resources, apart from being a large country with low population density, a pattern similar to that of Australia. With regard to Portugal, it is still developing its infrastructures, particularly the road network and the infrastructures related to the EURO 2004 to be hosted in

Portugal. It is worth noting the recent increasing trend in concession contracts related to the construction and improvement of the road network. Portugal has gone from 431 km of concessions in 1991 to a planned 2700 km of concessions in 2006- representing 90% of its motorway network (Molenaar, 2002).

CONCLUSIONS

This paper has analysed the evolution of the construction indicators and their relationships with measures of the national output in Portugal in the period from mid 1980s to 2002. In addition, a comparison was made between the pattern of the industry in Portugal and those from specific OECD countries and Lithuania. The analysis has shown that Portugal experienced, in general, a sustained economic growth in all the measures of construction industry activity, in line with the development of general economy. However, a trend of relative decline is observed in the late years of the period. The comparative analysis has demonstrated that Portugal, as middle income economy, has a higher share of construction that the advanced industrialised countries, which seems to corroborate Bon's assumptions regarding the decreasing share of construction in national output with the level of national income. However, this pattern does not hold for the construction volume. With respect to composition of construction output, the share of the R & M sub-segment in Portugal is far lower than in the other countries analysed in this study. This feature has implication for both public policies and the organisation of the construction enterprises in Portugal. major difficulty in the study was related to the problems derived from compatibility and reliability of data. Data, especially construction data in Portugal are poor and erratic, despite recent improvements in statistical coverage and in quality of data. Despite the best effort put in the analysis of data, further studies are needed to improve the compatibility of data that stem from different sources. Additionally, the period of the study must be broadened and should go back as far as 1970 in order to have a better comprehension of the long-run trends, at the macro level, of the construction industry in Portugal. This is the scope for further development.

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